MIAMIBEACH

OFFICE OF THE CITY MANAGER

NO. LTC # 212-2013

LETTER TO COMMISSION

TO: Mayor Matti Herrera Bower and Members of the City Commission

FROM: Jimmy L. Morales, City Manager

DATE: June 19, 2013

SUBJECT: Feral bee Activity within the City of Miami Beach

The purpose of this Letter to Commission (LTC) is to provide you with information concerning the procedures in place to address resident calls for service related to feral bee activity. Several times each month during the rainy season, the Parks and Recreation Department receives reports of beehives and or swarms on both private and public property. These reports come to the City, the Parks and Recreation Department and the Police Department in several ways namely phone calls, e-mail messages and the City Web page. Since the Parks and Recreation Department's Greenspace Management Division is responsible for the oversight of all city-controlled landscape, it is the appropriate service delivery unit to address these requests.

When bee related activity is reported, a Supervisor inspects the described location to determine if an active hive or a swarm is present, or just several bees pollinating flowering plants. According to the University of Florida IFAS Extension, "Swarming is bee reproduction at the colony level. When a colony swarms, the queen leaves the colony along with about 60% of the bees while the remaining colony members produce a new queen. Bees in swarms are generally docile and not defensive as they do not yet have a nest to protect". A hive is an established bee colony in which the bees can be very defensive and attack if they perceive a threat.

If the reported location is on private property, the supervisor attempts to make contact with the property owner to provide the name of a pest control company for inspection and resolution. If the bee activity occurs on public property, there are specific actions taken dependent on the situation. If a swarm is present, the surrounding area is taped/roped off to provide a safe zone while the swarm is present. Since swarm-resting locations are generally temporary (one to a few hours) in nature, no attempt to eradicate the bees is made if they are not visibly aggressive. Also, since there is a lead-time between time of call and site arrival of a certified professional, the swarm is generally undisturbed if possible.

In the case of active hives on public property, the pest control contractor is directed to the site and immediately takes the required steps to eradicate the hive. As recommended by the University of Florida IFAS Extension, the hive is eliminated due to the wide distribution of African honeybees and the difficulty in distinguishing between the African honeybees and European honeybees. Unfortunately, due to the highly aggressive nature of African honeybees and the possible toxic reactions to bee sting venom of their victims, the eradication of beehives located on public property is deemed necessary and classified as a public safety matter.

A contract is in place with a pest control vendor that maintains the certified Pest Control Operator (PCO) designation to perform this service. Certified PCOs are the only persons according to

Florida law permitted to apply pesticides to bees.

In the interest of public safety, bee activity reports are expedited and all actions taken are in direct compliance with Florida law and after careful research. The following attachments provide additional information concerning honeybees from the University of Florida IFAS Extension (See Attached).

Should you have additional questions, please contact Kevin Smith at (305) 673-7730.

JLM/JMT/MM/KS/JO
Attachment

UF UNIVERSITY of FLORIDA
IFAS Extension

ENY-144

Choosing the Right Pest Control Operator for Honey Bee Removal: A Consumer Guide[1]

M. K. O'Malley and J. D. Ellis[2]

As African honey bees continue to spread throughout the state of Florida, there is an increasing need for homeowners and property owners to locate and contract reliable, knowledgeable, and properly trained pest control operators (PCOs). African bees differ significantly in behavior from their cousins, the European honey bees (the gentle bees managed by beekeepers), and African bees can exhibit defensive behavior that can potentially compromise public safety. Trained professionals who remove honey bee colonies with proper equipment and appropriate procedures are essential to providing safe areas for work and play and eliminating bees without the hazard of neighbors, bystanders, or animals getting stung. This document will serve as a guide to the Florida resident who wishes to ensure that the honey bees on his or her property are safely and professionally removed.

When to Contact a PCO

Currently, the state of Florida recommends that all wild (or feral) honey bee colonies found in proximity to people (in walls, birdhouses, trees, etc.) be eradicated by a certified PCO. Statistics out of the Southwest show that 50% of Africanized honey bee stinging attacks occur in instances where the victim was aware of the colony's existence but did nothing about it. Therefore, if the nest had been initially removed, the stinging attack would not have occurred.

Many residents do not wish to eradicate honey bee colonies on their properties because the bees may not have been disturbed or caused any harm in the past; however, just because a colony is calm now does not mean that it will always be harmless. Honey bee colonies become more defensive once their nest is established as they have something to protect (honey, brood, pollen, etc.). Nest establishment can take a few months. Also, there is evidence that the average queen lives about 6 months to one year. When a new queen is emerges to replace the old queen, she leaves the colony to mate in the air with 15-20 different male bees (drones). Therefore, she is mating with any drones from nearby colonies (not with bees from her hive). If African bees are in the area, there is a possibility that the new queen will mate with African drones. The resulting offspring may display African characteristics. Therefore, a feral colony that was calm (or even European) 6 months ago may be defensive (or even African) today, and should be eradicated.

Florida residents aware of recent news reports about honey bees will recognize the threat that Colony Collapse Disorder or CCD is causing to the beekeeping and pollination industry (See *Resources* section at the bottom of this document for *Colony Collapse Disorder (CCD) in Honey Bees* Edis document.). The concern over the disappearance of honey bees caused by CCD is both warranted and important to the industry, and many residents are reluctant to have colonies eradicated as a result of this concern. However, as far as most experts are concerned the African

1. This document is ENY-144, one of a series of the Entomology and Nematology Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Original publication date June 2008. Reviewed January 2012. Visit the EDIS website at http://edis.ifas.ufl.edu.

2. M. K. O'Malley, Extension assistant, and J. D. Ellis, assistant professor, Entomology and Nematology Department, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL 32611.

bee issue and the disappearance of managed honey bees are unrelated. This means that eradicating one wild honey bee nest in Florida does nothing to hurt honey bee populations overall. In fact, there can be as many as 100-200 bee colonies per square mile in areas where African bees occur. So, even removing 1 colony does very little to the overall population of wild bees. It's simply a public safety issue. State officials are NOT searching for wild colonies in an effort to destroy them all. But, they do recommend that honey bees found nesting in proximity to people be eradicated by trained Pest Control Operators.

If a Florida resident has a colony or swarm of honey bees on his or her property, it is imperative that he or she contact a trained PCO as soon as possible.

How to Find a Trained PCO

The Florida Department of Agriculture and Consumer Services (FDACS) maintains a list of pest control operators who have been properly trained by either FDACS or University of Florida staff to safely remove honey bees. This list is available from the AFBEE Program website under the *Bee Removal* tab and from the FDACS website (links follow in *Resources* section of this document). PCOs that have undergone this training possess the necessary skills to remove and eradicate honey bee swarms and established colonies.

If a homeowner or property owner wishes to contract a PCO and is unsure if the pest control operator is trained in honey bees, the homeowner should inquire to ensure that the PCO has been trained for honey bee removal by FDACS or University of Florida staff, and that the PCO has experience removing stinging insects. If a PCO lacks either of these assets, the homeowner or property owner should not contract him or her for honey bee removal.

Customers in need of a PCO should consider entering into an official contract that states the specific terms of the removal. A contract should detail the colony removal procedure—method of applying pesticides, disposal of dead bees, and complete removal of comb. Often, a customer will hire a PCO to remove a honey bee colony from the walls of a house, but the PCO will not remove the comb or inform the customer of the importance of comb-removal. Several days after the bee removal, insect larvae (including wax moth larvae and small hive beetle larvae) feeding on the remaining comb can to enter the home, or stored honey drips out through the ceiling or seeps into the drywall and causes a stain. Without a contract that states specific removal terms, the customer has no recourse if these events occur.

What to Expect from a PCO

When PCOs are trained to deal with stinging insects and removal of honey bees, they are provided with removal procedures that include details such as what types of pesticides to use and when, the best times to remove a colony, what personal protective equipment to wear, etc. The following list gives some examples of things you *should* expect a trained PCO to do.

A PCO should:

- Wear personal protective equipment which includes a veil, sting suit and gloves
- Be able to recognize if the bees on your property are actually honey bees, and if the bees are in a *swarm* or a *colony* and be able to explain the difference to you (see document in *Resources* section: *Frequently Asked Questions about the African Bee in Florida* for more information about the difference between swarms and colonies)
- Explain that if the bees are honey bees they could be either African *or* European because it is impossible to differentiate the two without laboratory analyses
- Ensure that the area around the bees is secured from onlookers, pedestrians, anyone else who may be in proximity to the bee removal
- Ensure that no penned or tied animals are in or near the bee removal area
- Possess either a General Household Pest (GHP) license which covers indoor and outdoor removal—or a Lawn & Ornamental license (L&O) which covers removal of colonies and swarms *only if they are located outside*
- Apply only pesticides that are labeled for use on honey bees or labeled for use on the application area (e.g. some pesticides may not specifically mention honey bees on the label, but they may specify use in a wall void or ground cavity)
- Remove from the customer's property all dead bees and all combs associated with the colony. This is an essential aspect of the removal. If comb is not completely removed, cockroaches and other insects will be attracted

to the rotting brood, fermenting honey may produce an unpleasant odor, and melting wax may soak into the wall causing a stain and rendering that wall impossible to paint or wallpaper.

- Apply a residual pesticide to help protect against bees returning to the location; also, a swarm trap or sticky trap may be left in the area for up to one month to intercept any other swarms attracted to that location.

- Be responsible for checking, maintaining, and removing bees from any swarm trap or sticky trap left at the removed-colony location

- Discuss the removal procedure with the customer before beginning the removal. This is essential when the colony is located inside a wall or structure. Honey bee colonies established inside a structure and all comb associated with that colony should be removed as soon as possible, and the customer should be aware that a PCO may need to cut into a wall, subfloor, or other area of a structure to effectively perform the removal.

- Discuss bee-proofing with customer after completion of colony and comb removal (see *Resources* section for *Bee-Proofing EDIS document*)

Figure 1. A sticky trap is a triangle shaped piece of cardboard material coated with a sticky substance and baited with a pheromone that attracts bees. Sticky traps can be left in the area of a removed colony to intercept any bee stragglers.
Credits: AllFloridabeeRemoval.com

The following list gives some examples of things you ***should not*** expect a trained PCO to do.

Figure 2. A swarm trap is a cylindrical trap made from recycled wood pulp and baited with a pheromone lure that can be left along with, or instead of, a sticky trap to intercept bees returning to the area of a removed colony.
Credits: M. K. O'Malley, University of Florida

Figure 3. Appropriate personal protective equipment should be worn by a PCO whenever dealing with stinging insects. Protective equipment should include a veil, full suit, gloves and boots or foot/ankle protection.
Credits: M. K. O'Malley, University of Florida

A PCO should *not:*

- Attempt to remove bees without wearing appropriate protective equipment

- Apply wasp spray or any other substance not labeled for honey bees or the specific application area

- Remove established colonies during the day (unless discussed and agreed upon with you, the customer).

When colonies are removed during the day, the bees that are out foraging for nectar and pollen on flowers will return to the colony location in the evening. This will result in numerous bees flying around the colony location. If daytime removal is conducted, it is recommended that the PCO leave a swarm trap or sticky trap to intercept returning bees.

- Indicate that the bees are African bees (or European bees) because it is impossible to differentiate the two without laboratory analysess

- Charge more for African or Africanized honey bee colonies; it is impossible to differentiate between African and European bees without a series of laboratory tests. Additionally, the procedure should be the same for removing both races of honey bees—they are, after all, the same species.

Identifying the Bees

Many homeowners are curious to find out if the honey bees that were eradicated from their property were African or European bees. The FDACS lab in Gainesville currently conducts the testing for African honey bees. The testing involves the measurement of morphometric relationships between specific wing venations and other body parts. If after the bees are eradicated, a homeowner is still interested in finding out if these bees were African, he or she can submit a sample of bees to FDACS, Division of Plant Industry-Apiary Inspection Bureau. This identification process is not required (nor even requested) by FDACS personnel.

A sample of about 50 dead bees should be placed in an alcohol-filled jar, and the jar should be labeled with the date, location, and description of the colony. *Please note, a homeowner should never attempt to collect live bees for sampling.* Once the sample is prepared, a homeowner should contact Jerry Hayes from FDACS for information on where to send it:

Jerry Hayes, Assistant Chief
Bureau of Plant and Apiary Inspection
Apiary Inspection Section
Division of Plant Industry
Florida Dept. of Agriculture and Consumer Services
PO Box 147100
hayesg@doacs.state.fl.us
Phone: (352) 372-3505
Fax: (352) 334-0715

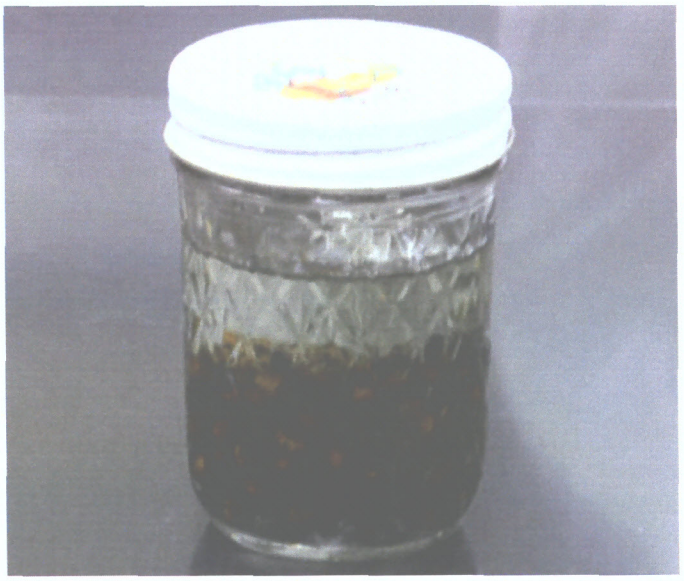

Figure 4. A sample of about 50 dead bees in an alcohol-filled jar ready to be sent for testing.
Credits: M. K. O'Malley, University of Florida

What a Customer Should Know

All Florida residents should be aware of the presence of African bees in Florida. This awareness should encourage healthy respect and caution of all stinging insects and a realization of the importance of honey bees nationwide. In addition to being aware of the African bee's presence, it may be helpful for a customer to know some basic biological and behavioral characteristics of this honey bee. Many resources exist to educate Floridians specifically about the presence of African bees. Please see the resources section for more information.

Additional Resources

Bee Proofing for Florida Citizens, EDIS

http://edis.ifas.ufl.edu/IN741

University of Florida, IFAS Extension publication that instructs homeowners and property owners in the specifics of bee proofing and its importance

Frequently Asked Questions about the African Honey Bee in Florida, EDIS

http://edis.ifas.ufl.edu/IN738

University of Florida/IFAS Extension EDIS document that addresses questions frequently asked about the African bee in Florida

What to do About African Honey Bees: A Consumer Guide

http://edis.ifas.ufl.edu/IN739

University of Florida/IFAS Extension EDIS document that offers recommendations and precautions to Florida's general public about the African honey bee

Colony Collapse Disorder (CCD) in Honey Bees

http://edis.ifas.ufl.edu/IN720

University of Florida/IFAS Extension EDIS document that discusses the details of the CCD phenomenon that is causing the disappearance of honey bees nation wide

AFBEE Program

or http://www.AFBEE.com

The African honey bee Extension and Education Program was established by the Florida Department of Agriculture and Consumer Services and the University of Florida, and it serves to educate all Floridians about the presence of African bees in Florida. The AFBEE Program website is a clearing house of information on African bees. In the resources section, customers can find fact sheets, presentations, videos, and educational documents catered specifically for their needs. The downloadable list of trained PCOs is available under the *Bee Removal* tab.

Florida Department of Agriculture and Consumer Services
Division of Plant Industry
Bureau of Plant and Apiary Inspection, African Honey Bee Page

http://www.doacs.state.fl.us/pi/plantinsp/ahb.html

This website includes links to videos, fact sheets, press releases, and more. It also includes a list of trained PCOs.

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EENY 429

African Honey Bee, Africanized Honey Bee, Killer Bee, *Apis mellifera scutellata* Lepeletier (Insecta: Hymenoptera: Apidae)[1]

James D. Ellis and Amanda Ellis[2]

Introduction

The African honey bee, *Apis mellifera scutellata* Lepeletier, is a subspecies (or race) of the western honey bee, *A. mellifera Linnaeus*, that occurs naturally in sub-Saharan Africa but has been introduced into the Americas. More than 10 subspecies of western honey bees exist in Africa and all justifiably are called 'African' honey bees. However, the term "African (Africanized) honey bee" refers exclusively to *A.m. scutellata* in the bee's introduced range.

Figure 1. Adult African honey bees, *Apis mellifera scutelatta* Lepeletier, on comb in colony.
Credits: William H. Kern, University of Florida

Subspecies of western honey bees are native to Europe and Africa but have been spread widely outside their native range due to their economic importance as pollinators and producers of honey.

Initially, only European subspecies of honey bees (hereafter referred to as European bees) were introduced into the Americas, where they were found to be productive in temperate North America, but less so in Central and South America where tropical/subtropical climates dominate. In response to the poor performance of European bees in Brazil, Warwick Kerr, a Brazilian scientist, traveled to southern Africa to screen African honey bee subspecies for productivity and viability. His visit resulted in the importation of *A.m. scutellata* into Brazil in the late 1950's.

Dr. Kerr hoped that through experimentation and selective breeding, the African bee could be made manageable and available for use by Brazilian beekeepers. As such, he initiated efforts to breed gentleness into the African stock while amplifying its many positive traits. The breeding effort was not carried to completion because the African bees swarmed accidentally, ending their initial quarantine. Following this, the bees began to spread throughout Brazil and into other parts of South America.

1. This document is EENY 429, one of a series of the Entomology and Nematology Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Original publication date February 2009. Revised December 2012. Visit the EDIS website at http://edis.ifas.ufl.edu.

2. James D. Ellis, assistant professor, Department of Entomology and Nematology; Amanda Ellis, Florida Department of Agriculture and Consumer Services, Division of Plant Industry, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL 32611.

All subspecies of *Apis mellifera* can interbreed or hybridize. Consequently, African bee hybridization with European bees became frequent as African bees moved into areas previously occupied by European bees. It is this hybridization with European honey bees that earned them the name 'Africanized' honey bees. Traditionally, 'African' and 'Africanized' have been used interchangeably although the former really refers to the pure race and the latter to the hybrid.

Distribution

The spread of African bees throughout South and Central America — fueled by rapid hybridization with European subspecies and the dominance of many African alleles over European ones — occurred at a rate of 200 to 300 miles per year. Because their movement through South and Central America was rapid and largely unassisted by humans, African bees earned the reputation of being one of the most successful biologically invasive species of all time. In 1990, populations of African honey bees had saturated South and Central America and begun to move into the USA. As of 2012, African honey bees had been found in the southernmost USA: Texas, California, New Mexico, Arizona, Oklahoma, Louisiana, Arkansas, Alabama, and Florida. The spread of African bees in the U.S. continues, albeit at a much slower rate than what occurred throughout South and Central America. This slowed rate of territory expansion appears due to climatic limitations, among other factors. African bees do not survive in temperate climates as well as European bees do. Therefore, they have failed to establish populations below about 32° latitude in the southern hemisphere. Although they have expanded beyond this parallel in the northern hemisphere, African bee expansion northward also appears limited climatically, being found only below about 34° latitude currently.

Figure 2a. Native distribution of *Apis mellifera scutelatta*

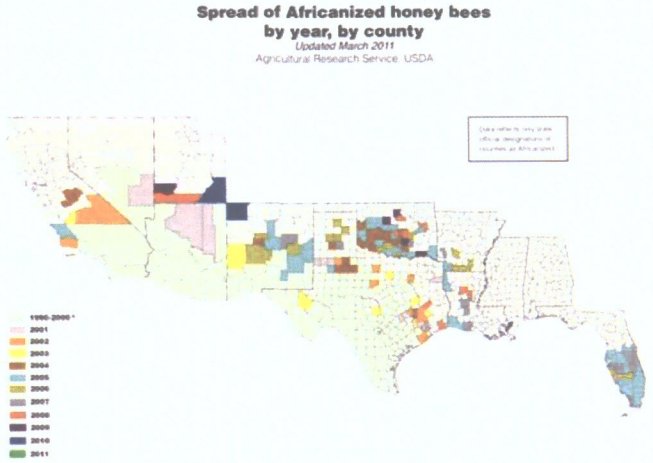

Figure 2b. Spread of the Africanized honey bees in the US by year, by county. http://www.ars.usda.gov/research/docs.htm?docid=11059&page=6
Credits: USDA ARS

Description

African honey bees cannot be distinguished from European honey bees easily, although they are slightly smaller than the various European races. Laboratory personnel use morphometric analyses to determine the likelihood that a given colony is Africanized or fully African. With honey bees, the measurement of wing venation patterns and the size and coloration of various body parts (morphometry) are important determinants of identification at the subspecific level. Morphometry has been used to differentiate honey bee races since the 1960s and remains the first round of identification when suspect colonies are discovered.

Morphometric analyses were first used to differentiate Africanized and European honey bees in South America in 1978. A more rigorous identification is achieved by genetic analysis and often is necessary when the suspect bees are a hybrid between African bees and the European subspecies.

Other differences between African and European bees manifest themselves behaviorally. To the casual bystander, the primary identifying behavioral characteristic of Africanized bees is their heightened defensiveness compared to that of European subspecies. Selection pressures induced by man may be, in part, responsible for this increased

Figure 3. Distribution of *Apis mellifera scutelatta* in the Americas as of 2007.

defensiveness. 'Beekeeping' (management of honey bee colonies by humans) is more common in Europe, where the native honey bees have been bred for gentleness and ease of management. In contrast, 'honey hunting' (near-complete destruction of hive to harvest contents) is more common in Africa, resulting in a bee that is more defensive of its nest. Other selection pressures that might have led to a heightened defensiveness in African bees include climatic stresses, resource availability, and predation by birds, mammals, and various reptiles. These selection pressures resulted in an African race of bee that can be many times more defensive than most of the various European races of bee.

All honey bees readily defend their nests, and an attack usually means that the victim is too close to the nest. While European races of bees may attack a nest intruder with few bees (usually no more than 10-20 bees), African bees may attack the same intruder with hundreds of bees. Further, African bees generally defend a larger radius around their nest and usually require lower levels of stimuli to initiate an attack. Because of these characteristics, African bees are capable of killing large mammals, including man. This defensiveness has earned them the nickname 'killer' bee. It is important to note that their ability to kill humans has nothing to do with their size or the potency of their venom. African bees are smaller than European bees and probably deliver a comparatively smaller dose of venom to their victim than do European bees. Because both bees use the same type of venom, human deaths usually are a result of the number of stings received rather than an increased potency of African bee venom, unless the victim is allergic to bees, in which case a single sting can cause death.

Another behavioral difference between African and European bees concerns colony level reproduction and nest abandonment. African honey bees swarm and abscond in greater frequencies than their European counterparts. Swarming, bee reproduction at the colony level, occurs when a single colony splits into two colonies, thus helping to ensuring survival of the species. European colonies commonly swarm one to three times per year. African colonies may swarm more than 10 times per year. African swarms tend to be smaller than European ones, but the swarming bees are docile in both races. Regardless, African colonies reproduce in greater numbers than European colonies, quickly saturating an area with African bees. Further, African bees abscond frequently (completely abandon the nest) during times of dearth or repeated nest disturbance, while this behavior is atypical in European bees.

Figure 4. African honey bee, *Apis mellifera scutelatta* Lepeletier, swarm in tree.
Credits: Michael K. O'Malley, University of Florida.

Another common difference between African and European honey bees is their choice of nest locations. African honey bees are less selective when considering a potential nesting site than are European bees. They will nest in a much smaller volume than European honey bees and have been found in water meter boxes, cement blocks, old tires,

Figure 5. African honey bee, *Apis mellifera scutelatta* Lepeletier, swarm on palm fronds.
Credits: W. H. Kern, University of Florida.

house eaves, barbecue grills, cavities in the ground, and hanging exposed from tree limbs, just to name a few places. One rarely finds European colonies in any of these locations because they prefer to nest in larger cavities like those provided by tree hollows, chimneys, etc. As one can imagine, humans inadvertently provide multiple nesting sites for African bees. Therein lies the primary reason African bees are encountered frequently by humans.

A final behavioral curiosity of African bees concerns nest usurpation (or colony takeover) of European colonies. Small African swarms containing a queen often land on the outside infrastructure of a European colony (a wall, beekeeper-managed hive, etc.). As time passes, the worker bees in the African swarm begin to exchange food/pheromones with the European workers from the colony. This gradually ensures the adoption of the African bees into the European colony. Somewhere during this process, the European queen is lost (perhaps killed by the African bees – her fate remains uncertain at this point) and the African queen is introduced into the colony, thus becoming the reigning matriarch. European bees do not display this behavior but often fall victim to it, thus creating an African colony from a preexisting European one.

Other behavioral differences between African and European races exist and are worth discussing briefly. For example, African bees are often more 'flighty' than European bees, meaning that when a colony is disturbed, more of the bees leave the nest rather than remain in the hive. African bees use more propolis (a derivative of saps and resins collected from various trees/plants) than do European bees. Propolis is used to weather-proof the nest and has various antibiotic properties. African colonies produce proportionally more drones (male bees) than European bees. Their colonies grow faster and tend to be smaller than European colonies. Finally, they tend to store proportionately less food (honey) than European bees, likely a remnant of being native to an environment where food resources are available throughout the year.

Figure 6. An African honey bee, *Apis mellifera scutelatta* Lepeletier, colony between buttress roots of a tree.
Credits: W. H. Kern, Jr., University of Florida

Life Cycle and Biology

Mating biology and developmental time play an important role in the success of African bee colonies in replacing European colonies in an area. For the most part, mating and developmental biology are similar for African and European bees, but key differences confer adaptive benefits to the former.

Virgin queens of all western honey bees emerge from peanut hull-shaped waxen cells. After a short time of further maturation, a virgin queen will leave the colony to mate with drones. All mating occurs in the air, with the fastest drones being the most successful suitors. Queens will mate multiple times over the course of seven to 10 days and during this time they will mate with an average of 10 to 20 drones. Queen bees store semen in an organ called

a spermatheca. African colonies produce more drones per colony, so drone populations in an area tend to favor African bees. As such, virgin European queens are more likely to mate with African drones rather than European ones. Further, flight time and distances of mating flight from the colony tend to result in European queens encountering African drones more often than European drones, thus setting the stage for hybridization.

All honey bees undergo complete metamorphosis, but the time from egg to adult varies by subspecies. The newly-mated queen bee oviposits in wax cells constructed by worker bees. Fertilized eggs result in female offspring, either workers or queens. If fed a diet rich in royal jelly, the female larva will develop into a queen, with the reciprocal true for the development of workers. Drones result from unfertilized eggs and consequently only inherit genetic material from their mother (they have no father).

Developmental time varies by caste member (see the development time table) and favor African honey bees because they generally develop faster than European bees. When bee colonies decide to make a new queen, newly-emerged female larvae are fed royal jelly constantly. Because Africanized offspring, including queens, develop faster than European offspring, a queen having an African genotype is more likely to emerge earlier than a queen with a European genotype. The first queen to emerge kills her queen sisters that have not yet emerged from their cells. The Africanized virgin proceeds to mate in an area having higher densities of African drones. Over time, this results in the colony becoming more African with the European behavior being replaced almost altogether. This process is exacerbated further due to the dominance of many African genetic traits over European ones.

Finally, African bees are more resistant to many honey bee pests and pathogens than are European bees. Western honey bees face a myriad of pests and diseases, the most severe of which include Varroa mites (*Varroa destructor*), tracheal mites (*Acarapis woodi*), small hive beetles (*Aethina tumida*), and American foulbrood (*Paenabacilis larvae*). These bee pests almost eliminated all wild colonies of European honey bees in North America. Because African bees are resistant to many of these pests and diseases, their survivorship in the wild is favored over that of European bees.

Public Risks

Due to their heightened defensive behavior, African honey bees can be a risk to humans. Children, the elderly, and handicapped individuals are at the highest risk of a deadly attack due to their inability or hampered ability to escape an attack. African honey bees are agitated by vibrations like those caused by power equipment, tractors, lawnmowers, etc. Further, their nesting habits often put them in close proximity to humans. Because of this, precautions should be taken in an area where Africanized honey bees have been established. These precautions are not suggested to make people fearful of honey bees but only to encourage caution and respect of honey bees. The precautions include remaining alert for honey bees flying into or out of an area (suggesting they are nesting nearby), staying away from a swarm or nest, and having wild colonies removed from places that humans frequent. The latter is perhaps the most important advice one can heed when dealing with African bees. In the USA, a large percentage of African bee attacks occur on people who know a nest is present but elect not to have it removed (or try to do it themselves).

Figure 7. African honey bee, *Apis mellifera scutelatta* Lepeletier, colony that has established itself in a swarm trap.
Credits: Michael K. O'Malley, University of Florida.

Table 1. The developmental time in days (from egg to adult) of European and African honey bees.

	European honey bees	African honey bees
Queen	16	14
Worker	21	19-20
Drone	24	24

If an attack occurs, remembering a few simple recommendations will increase one's chances of minimizing the effects and severity of the attack. If attacked, a victim should run away from the area using his shirt to cover his head and especially airways. Running through tall grass or small trees will help to disrupt the attacking bees. The victim should not stand and swat at the bees. The bees are defending their nest, and the victim needs to get away from that nest as quickly as possible. It is important that the victim get cover in a bee-proof vehicle or structure if either is available. One should not jump into the water or hide in bushes. The bees can remain defensive and in the area for some period of time, thus increasing the risk to the victim. If stung, the victim should remove the stinger quickly by scraping it rather than by pulling it. One should see a doctor immediately if breathing is affected.

Figure 8. Defensive African honey bees, *Apis mellifera scutelatta* Lepeletier, stinging black cloth and leaving behind stinger and venom sacs.
Credits: W. H. Kern, University of Florida

Many African bee attacks can be prevented by limiting the number of nesting sites that are available to the bees. A homeowner, school worker, etc., can 'bee proof' his or her property by eliminating possible nesting sites. This can be accomplished by removing any unnecessary debris from an area and closing off wall, chimney, electrical, and plumbing-related gaps that are more than 30 mm wide using a small-mesh hardware cloth or caulking. This will limit bee access to potential nesting sites. Finally, one should check walls and eaves of structures regularly, looking for bee activity.

Economic Impact

The economic impact of African bees in an area can be substantial. Keepers of European bees often notice a decrease in resource availability for their bees because the density of African bee colonies in an area, and thus the demand on the available resources is high. Furthermore, cities, municipalities, etc., often initiate eradication programs, with much futility. Finally, the loss of animal and human lives is a tragic occurrence, being beyond measurable cost.

African bees also may affect the environment negatively. African bee colony densities in area can be very high. Resultingly, African bees may have a substantial impact on the native flora and fauna in an area. While this impact often is not reported and largely is not understood, it could be significant considering the potential number of colonies and their need for resources. Thus, the world's most infamous honey bee is among nature's most enigmatic creatures.

Management

It is important to remember that African honey bees pollinate crops and produce honey just like other races of honey bees. Beekeepers in South Africa use African honey bees as the bee of choice in their operations. So, African bees can be managed efficiently and safely, but the skills required to manage African bee colonies differ from those required to manage European bee colonies.

In general, the management of African bee colonies has been discouraged in the U.S. while accepted in Central and South America. This may have to do with the public perception of honey bees, particularly African bees, in the USA and the robust legal system in place in the USA. On the other hand, beekeepers in Central and South America routinely use African bees in their operations with slight management modifications. In fact, some South American countries are among the leading honey producers in the world, due largely to the presence of African bees in the country.

Beekeepers in South and Central America utilize a number of management practices in order to keep African bees. First, they keep single bee colonies on individual hive stands rather than using one hive stand for multiple colonies. This limits the management activity to one colony at a time rather than aggravating other colonies while working only one.

Secondly, beekeepers in South and Central America use ample amounts of smoke when working African bee

colonies. It is believed that smoke masks the alarm pheromone of the bees, thus lessening the defensive response of the colony. Most South and Central American beekeepers agree that copious amounts of smoke should be used when working African bee colonies. It is important to smoke the colonies well before any work is done, for once bees from a colony are agitated, smoke may fail to calm them down.

Beekeepers managing African bees wear appropriate protective gear. A typical beekeeper working an African colony would wear a full bee suit, boots, gloves, and a bee veil. Bee veils (protective headgear) are worn by almost all beekeepers worldwide. Traditionally, the veil mesh protecting the face is colored black to keep down the sun's glare. African bees (and most honey bees) attack dark colors, so black-faced veils often get covered with bees. Consequently, beekeepers can use white-faced veils to keep the bees off of their veils. Beekeepers managing African colonies often tape their bee suits to their boots and gloves to limit the possibility of bee access.

Finally, some beekeepers in areas with African bees try to requeen African bee colonies with European queens. This is not a common practice in sub-Saharan Africa. Most African beekeepers in areas having African bees gladly use the bee in their operations, paying little attention to the bees' defensiveness.

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